THE

YOUNG MECHANIC.

JULY, 1833.

For the Young Mechanic.

CHEMISTRY.

HYDROGEN.

Inflamable air. Phlogiston, of some writers.

The existence of hydrogen was known at a very early period; but the first proof of its being a distinct gas was derived from the experiments of McCavendish in the year 1776. It is largely diffused throughout nature in combination with other bodies. It gives the power of burning with flame to all those substances used for the economical production of heat and light. It forms a part of animal and vegetable bodies, water, mineral coal, and other important compounds which will be mentioned hereafter.

Hydrogen gas is colorless, transparent, elastic, tasteless, inodorous. As usually prepared, it possesses a slightly fœted odor, supposed by some to be owing to a volatile oil formed by the union of hydrogen with carbon, from the metal, by which it is prepared, by others to arsenical particles obtained from the zinc. It is an element in relation to our knowledge. It is the lightest form of matter with which we are acquainted; its sp. gr. is 0.0694, air being 1; 100 cub. in. at medium temperature and pressure weigh 2.116 gr. Its combining proportion is represented by 1.

100 cub. in. water, freed from air, absorb 1 1-2 inches of hydrogen at the ordinary pressure; by strong pressure it may be made to take up one third of its volume.

It refracts light more powerfully than any other gas.

It is electro-positive.

The specific heat of hydrogen in comparison with an equal weight of air, is as 12.3401 to 10000, as estimated by M. Berard and De la Roche. It is inflammable: is not a supporter of combustion. A lighted taper inserted into a jar containing hydrogen inflames the gas, but is itself extinguished. The temperature at which it inflames, according to Dr. Thomson, is 1000° F. When pure, the flame is nearly colorless. If a glass tube open at both ends be held over a jet of hydrogen while burning, musical tones will be produced; varying with the length and diameter of the tube. The sound is supposed to be occasioned by repeated explosions, produced by a union of the hydrogen with the oxygen of the atmosphere in the tube. Similar sounds may be produced by some other gases.

The most common process made use of for obtaining hydrogen gas is to decompose water by means of zinc and sulphuric acid. For this purpose, place in a glass or lead retort, 1 part of zinc or iron in fragments, and 6 parts of water; 2 parts of sulphuric or muriatic acid must be added in successive portions as may be required. The first portion of gas generated should be suffered to escape as it forms an explosive mixture with atmospheric air.

During this process, the oxygen of the water combines with the zinc forming oxide of zinc which unites with the acid forming sulphate or muriate of zinc, while the hydrogen of the water is set free. How the acid operates in this case to effect decomposition of the water, we are ignorant. It is a case of what has been termed disposing affinity; but we cannot suppose that the affinity which the acid has for the oxide can operate to produce the oxide. Murray suggests that the acid, in this case, exerts a simultaneous attraction towards the oxygen of the water and the metal. We have no evidence to support this suggestion.* 1 ounce of iron will yield 782 cubic inches hydrogen gas; 1 oz. zinc yields 676 cubic inches.

Hydrogen, as usually prepared, contains carbonic acid, and sulphureted hydrogen; from which it may be freed by introducing lime or caustic potassa. A little carburetted hydrogen is sometimes present; to prevent this, the zinc should be previously distilled.

Hydrogen gas is used for filling balloons; and owing to its extreme lightness, it is better adapted for this purpose than any other substance. It is used also for the reduction of metallic oxides on the surface of ribbons, &c. for ornamental purposes. For this purpose, the ribbon is stamped with a solution of the metal in an acid and exposed to a current of hydrogen gas. It is a useful agent in the analysis of gaseous mixture, and in combination with oxygen, it is used to obtain an intense heat. By directing the flame of this mixture upon lime an intense light is produced; in a communication to the Royal Society of London on the subject of light-houses, Lieutenant Drummond states that a ball of lime 3-8th of an inch in diameter treated in this manner afforded a light equal to thirteen argand lamps.

* For other processes for obtaining hydrogen, see analysis of water in the next article.

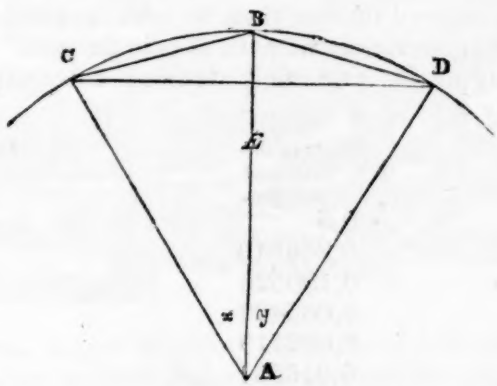
GEOMETRY AND ARITHMETIC.

[Continued from page 89.]

CIRCLE.

To calculate the ratio of the *diameter* to the circumference, mathematicians have compared the circumference of a circle to the sum of all the sides of a regular inscribed polygon of a great number of sides; for it has been shown (page 88) that the circumference of a circle differs very little from the sum of all the sides of such a polygon.

For this purpose they took a regular inscribed *hexagon*, each of the sides of which is equal to the radius of the circumscribed circle. For the sake of convenience they supposed the diameter of the circle equal to unity; the radius, and therefore the side of a regular inscribed hexagon is then $\frac{1}{2}$, and the sum of all the sides (6 times 1-2) equal to 3. This is the first approximation to the circumference of a circle.



From the side of a regular inscribed hexagon, it is easy to find that of a regular inscribed polygon of 12 sides. Supposing, for instance, the chord CD to be the side of a regular inscribed hexagon, by bisecting the arc CD in B, the chords BC, BD, will be two sides of a regular inscribed polygon of 12 sides, the length of which can easily be calculated when the chord CD and the radius AC are once known. For the radius AB which bisects the arc CD, makes the angles x and y, which are measured by the arcs DB, BC, equal to each other; and therefore AE is perpendicular to the chord DC, and bisects it in E.

Now the radius AC and EC (half of CD), being known, the hypothenuse and one of the sides of the right-angled triangle AEC are given; whence it is easy to find the other side AE, by the rule given page 72. Thus if the radius is supposed to be 1-2, the side CB of the inscribed hexagon is also equal to 1-2; and EC (half of CD) is $\frac{1}{4}$. Taking the square of 1-4 from that of 1-2, and ex-

tracting the square root of the remainder, we obtain the length of the side AE, which, substracted from the radius AB, leaves the length of BE. Now we can find the side BC, in the right-angled triangle BCE, by extracting the square root of the *sum* of the squares of BE and EC (see page 72); and one of the sides of the regular inscribed polygon of 12 sides being once determined, we need only multiply it by 12, in order to obtain the sum of *all* its sides, which is the *second* approximation to the circumference of the circle. In precisely the same manner can the sides, and consequently also the *sum* of all the sides of a regular inscribed polygon of 24 sides be obtained, when those of a regular inscribed polygon of 12 sides are once known; which is the third approximation to the circumference. Thus we might go on finding the sum of all the sides of a regular inscribed polygon of 48, 96, 192, &c. sides, until the inscribed polygon should consist of several thousand sides: the sum of all the sides would then differ so little from the circumference of the circle, that, without perceptible error, we might take the one for the other.

In this manner the approximation to the circumference of the circle has been carried further than is ever required in the minutest and most accurate mathematical calculations.

The beginning of this extremely tedious calculation gives the following results.

Parts of the circumference.	Sides of the inscribed polygon.	Sum of all the sides of the inscribed polygon.
6	0,5	3
12	0,258819	3,105228
24	0,130526	3,132628
48	0,065403	3,139348
96	0,032719	3,141033
192	0,016361	3,141446

It is not necessary to carry this calculation any further, since analysis furnishes us with means to obtain the same results in a much easier manner.

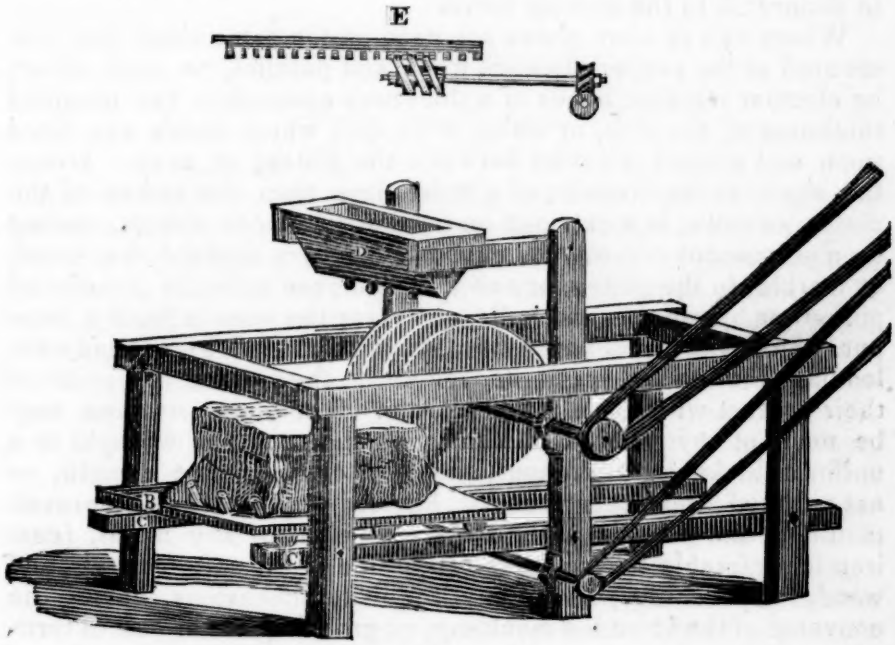
The substance of the preceding is taken from Grund's Plane Geometry.

Various attempts have been made by different persons from the time of Archimedes to the present, to find the ratio of the circumference of a circle to the diameter; and some of them have extended it to more than 100 places of decimals; but the process is very tedious, and the further extension of it useless, as seven places of decimals is sufficient for any practicable purpose; in fact, the common factor 3.1416 consisting of four decimal places, is the one commonly used by mechanics, by which many problems relative to the circle may be solved; these I shall attempt in my next.

PHILO.

KIRK'S MACHINE.

Specification of a patent for an improvement in the method of Sawing Marble, and other stone, and cutting or working mouldings, or groovings, thereon, and polishing the same. Granted to ISAAC D. KIRK, city of Philadelphia; first issued July 3, 1832. Patent surrendered, and reissued on an amended specification, December 28, 1832.



A. The saws, or the moulding cylinder of soft cast iron.
B. Carriage to support and carry forward the marble, or stone.
C C. Rails on which the carriage travels.
D. Hopper for sand and water.
E. Apparatus for advancing the carriage.

To all to whom these presents shall come, be it known, that I, Isaac D. Kirk, of the city of Philadelphia, and State of Pennsylvania, have invented a new and useful improvement in the method of sawing marble and other stone, and cutting, or working, mouldings, or groovings, thereon, and polishing the same; the sawing being performed by means of an improved revolving, circular, metallic plate, smooth, or without teeth, upon the face, or edge, operating by friction with sand and water upon the material to be cut; and the moulding, or grooving, and polishing, being effected by means of the improved revolving moulding and polishing cylinder, or wheel, operating in cutting mouldings by friction with sand and water upon the surface to be wrought; and in polishing by

friction, in like manner, with putty, buff, pumise-stone, or some other suitable material; viz. one or more circular metallic plates, smooth or not serrated upon the face, or cutting edge, (copper, or soft iron are deemed preferable,) are securely fixed, vertically, upon a horizontal shaft, or spindle, of iron, of any required dimensions, passing through the centre of the plate, or plates, and supported at each end by a proper frame of wood, or of cast iron, upon which the shaft works. On one end of the shaft is a cog wheel to connect it to the moving power.

Where two or more plates are used on the same shaft, they are secured at the proper distance from, and parallel, to each other, by circular metallic bands of a thickness adapted to the intended thickness of the slab, or slabs, to be cut; which bands are fitted upon and around the shaft between the plates, or saws. Under the shaft, at the distance of a little more than the radius of the plates, or saws, is a carriage on friction rollers, or wheels, resting on a permanent rail-way, to support and carry forward the stone, or marble, to the plates, or saws; it is moved either by a rack and pinion, or by weights and pulleys. Over the saws is fixed a hopper, filled with sand and water, which is carried by a conductor leading from an apeture in its bottom, to the saws at the point of their contact with the stone or marble. The plates, or saws, may be made of any required dimensions, and must be wrought to a uniform thickness throughout, with the cutting edge smooth, or not serrated, and either rounded, beveled or flat. The improved moulding and polishing cylinder, or wheel, is of any metal, (cast iron is preferable for moulding, and some of the softer metals, and wood, for polishing,) and of any requisite dimensions, having the converse of the intended moulding, or grooving, either cast or turned upon its surface, or periphery, by means of which any series of mouldings, or groovings, can be wrought on a surface of marble, or stone, at one operation, and in like manner be polished. It is fixed on a horizontal shaft passing through its axis, which is turned by a cog wheel connecting it to the power, and operates on the material to be wrought, by revolving vertically against its surface in contact with sand and water in cutting mouldings, and in contact with pumice-stone, buff, putty, or some other suitable material in polishing. A cylinder, having a regular smooth surface, is used in like manner for flatting, and for polishing a plain surface. The marble, or stone, is carried forward, and under the moulding and polishing cylinders by a mechanical arrangement similar to that before described.

The polishing cylinder is similar in form to the above, and used in like manner with polishing powder, as putty, buff, &c. instead of sand, and is made of wood, or some of the softer metals.

The improvement claimed by said Isaac D. Kirk, consists in the sawing of marble, or other stone, by means of a revolving, circular, metallic plate, smooth, or not serrated, on the face, or edge,

and applied with sand and water, as is done with the straight saw; and also in making, or forming upon the surface, or periphery, of a metallic, or wooden cylinder, or wheel, the converse of the intended moulding, or grooving; by means of which, a series of mouldings, or grooves, can be wrought on a surface of marble, or stone, at one operation, with sand and water. And in like manner, polished with putty, buff, pumice-stone, or other polishing material.—[*Journal Franklin Institute.* ISAAC D. KIRK.

For the Young Mechanic.

ARCHITECTURE.—No. IV.

AMONG the nations of antiquity, Egypt, India, and Persia, were distinguished for the beauty and grandeur of their architecture.—But it is still a matter of controversy, to which of these nations belongs the credit of making the first improvements, in the art of building. Without, however, touching the question of priority (which probably never will, nor can be settled) we will briefly notice the peculiarities in the architecture of each of these three ancient nations. And first of Egypt. The ancient structures of Egpyt, were built of stone and were of three different forms. First, the simple pyramid. Second, apartments enclosed by sculptured walls, with flat roofs, supported by rows of columns, and connected by open porticos. And third, caverns, grottos, or tombs.—Which of these forms of building, was first practiced by the Egyptians, is a question upon which much has been written; but as there is no historical evidence, which throws the least light on this inquiry, the matter must always remain unsettled.

The peculiarities which belong to the Egyptian style, are the following. The walls of their edifices were universally of immense thickness, and sloping on the outside. The roofs were flat and without pediments. Columns of large diameter, short, and placed very near together. Ornaments in abundance; consisting of hierogliphics, images of animals and fabulous deities. These covered their walls, and were sometimes carved on their columns, and entablatures. But generally the entablature consisted of vertical flutings, with a winged globe in the centre.

Gigantic pyramids, colossal statues and towering obelisks, belong to Egyptian architecture. The astonishing magnitude and grandeur of some of the ancient edifices, exceeds all description. As a specimen take Kamack. This was the greatest edifice in Egypt, and was dedicated to Priapus. The court was 110 paces in length, and the same in breadth. Two ranges of six columns conduct to a portico of 136 columns. The two middle ranges of these, are 11 feet diameter. The others are 7; the length of this vestibule is 78 paces, the breadth 25: it leads into a court where there

are four obelisks, and 12 colossal figures. Two other courts conduct to what is supposed the apartments of the Kings. Adjacent to the great palace, are many other extensive buildings, connected with it by avenues of sphinxes, lions and rams.

The most perfectly executed of the Egyptian temples is that of Tentyra. The front of the building is 72 paces in breadth, 145 in depth, and 70 feet in height. A most elegant door way conducts into a portico 60 paces by 30, supported by 24 columns, 7 feet diameter, and 35 in height. The hall which succeeds the portico, is 24 paces square. It is supported by 6 columns, whose capitals are each composed of four figures of the head of Isis with the ears of a cat; the second hall is 24 paces by 10; the third is of the same dimensions. The apartment which succeeds the last hall is 24 paces by 6, and is insulated by a space on each side of it; this was probably the sanctuary. In the second hall there were two stair cases, which led to the terrace or roof.

All the edifices of Egypt, were of amazing solidity. This characterestic was owing to the prevailing belief that the souls of the dead would return again to the earth, after a certain period, and inhabit the same bodies which they had left, and the buildings.

D. B. H.

PATENTS FOR MASSACHUSETTS.

Granted in November, 1832.

From the Journal of the Franklin Institute.

For an improvement in the *Common Spindle for Spinning Cotton;* Nathaniel Rider, Dudley, Worcester county, Massachusetts, November 3.

The common live spindle is to be surrounded by a tube along that part of it upon which the bobbin is usually placed; this tube is to receive the bobbin, which then occupies the same part, in relationship to the flyer and whirl, which it would were the tube not there; the bobbin is also made to rise and fall on the tube as it would on the naked spindle. The advantage said to result from this is, the creation of a friction which gives an easier and more steady draft, especially when the motion is rapid. The washer, it is stated, should be much smaller than that now in use on the live spindle. The claim is to the particular form of the tube, and the metallic washer. The drawing which accompanies the specification is without written references, but those acquainted with the subject, will perceive the nature of the thing claimed.

For an improved mode of *Moving the Rudders of Ships* in steering; Elijah Soule, Duxbury, Plymouth county, Massachusetts, November 3.

The steering is to be effected by means of a cogged wheel which works in a rack, forming the segment of a circle. This circular

segment is affixed to the deck, at its two ends, by metallic pillars, or standards. The hangings of the rudder are the centre of the circle of which the curved rack is a segment. The steering wheel is to be made in the ordinary way, but it has a pinion on its axis which takes into the upper side of the cog wheel, the lower side of which mashes into the rack. The uprights, which support the steering wheel and its appendages, are securely fastened on to the end of the tiller, and traverse with it in steering. There is a contrivance for keeping the rack and cog wheel in gear, and preventing derangement from blows and jerks.

The claim is to 'the application of the steering wheel and pinion on its axis, and the cogged wheel to the curved rack, or segments, to produce a motion of the rudder either to the right or left.'

Instead of the mode of fixing the rack and pinion above described, it is proposed sometimes to attach the rack firmly to the tiller, and the standard of the steering wheel to the deck. This latter mode we should suppose to be the best, as the steersman will then keep his station opposite to the binnacle, whilst in the former mode he has to follow the tiller towards either side of the vessel.

For an improvement in the *Turning Lathe;* John Bisbee, Plainfield, Hampshire county, Massachusetts, November 8.

The lathe here described is intended for turning sticks, used for broom handles, or other purposes, either straight or tapering, and with such ornamental beads, or mouldings, as may be required.

A sliding cat-head, of cast iron, has a hole through it, of such size as just to admit the stick when it has been rounded by a gouge fixed for the purpose. A lever attached to, and working on, a pin in the cat-head, carries a second gouge and a smoothing chisel, the gouge cutting the stick to the size required, and the smoother finishing it as it passes through the hole. There is a contrivance for allowing the cutters to advance for the purpose of making the stick taper, and what is called a buzz, for forming the ornamental parts. The particular construction of the mandril, and of the front centre, are described by the patentee, but those and the other parts relied on as new are not sufficiently well represented in the drawings to give an exact idea of them, so as to enable a workman to make them without exercising his inventive powers. We again repeat the fact that it is of little consequence, in a legal point of view, that they may be understood from an examination of the model; this, we have often said, makes no part of the patent, as it cannot be placed on file, or published for the information of the community.

The claims made are to the 'giving the cat-head such a form that the second cutter, or gouge, and the smoother may be connected with it, and at the same time be raised or lowered by a rest; and placing the edges of the dies in such a position as to cut naturally and smoothly to any size wanted; also the turning buzz,

however it may be applied; the hole and piece in the end of the centre pin; the sliding rest, and the moveable spindle, or mandril, with its ring edge, and edge across its centre.'

Where claims are made, in this way, to the individual contrivances appended to an instrument so long and universally employed as the lathe, there is no small danger of following in the track of a preceding traveller. Cutters in sliding heads, sliding mandrils, buzzes, moveable centres, and most of the things above enumerated, have been repeatedly and variously applied; we think, therefore, that the claim in a case like the foregoing, should be to the general arrangement and combination of the respective parts described, so as to produce the effect intended, and set forth in the description.

For machinery for *Hulling and Polishing Rice*, Barley, &c. &c.; Theodore F. Strong, and Marcus T. Moody, Northampton, Massachusetts, November 17.

The seeds are to be first passed between mill stones, the runner being raised so as merely to crush the hull, then after being winnowed they are to pass through the machine for which the present patent is obtained. This machine consists of a truncated cone on a vertical shaft, working within a hallow truncated cone. The edge of the truncated cone, and the interior of the hollow cone are to be covered with cards, or wire points, in such a way that they shall be elastic. In passing between these, the hulling is to be completely effected. When required to be more perfectly polished, the grain is to be passed again through a similar machine, furnished with a dog-fish skin, bristles, or other suitable substance. The claim is to the machinery made as above described.

CAST IRON TRINKETS.

[Translated from the French for the Journal of the Franklin Institute.]

The desire expressed by some of our subscribers to have the receipt for the varnish employed on the cast iron trinkets of Berlin iron, so called, induced us to request a person conversant with the different processes of the arts, to ascertain the best method of making that varnish. We now give a recipe, not for the varnish itself, but for a black coating which can be applied to any description of cast iron articles. This composition is simple, and offers the invaluable advantage of efficaciously resisting the action of the atmosphere, and even of weak acids, so that the process may be employed for coating a great variety of cast utensils commonly used in our families. The coating easily fixes itself on cast iron, and may also be used on hammered iron, but with less certainty of success in the latter case than in the former.

Attach each of the articles to be coated to an iron wire bent above into a hook; and apply a thin coat of linseed oil; the coat must be thin to prevent the oil from running, forming asperities or knots where it collects. Hang them eight or ten inches above a wood fire, so that they may be completely enveloped in the smoke. When they have been thus exposed to a brisk fire for about an hour, lower them so that they shall be near the burning coals, without touching them; at the expiration of about 15 minutes, remove the articles, and immediately immerse them in cold spirits of turpentine.

Any articles which, after this last operation, may be found deficient in brilliancy, or not sufficiently black, are to be re-exposed to the burning coals for a few minutes, and again dipped in the spirits of turpentine.

This process, which may be variously modified to suit different articles, may, from its simplicity, be extensively applied, and will prove useful in all the cases in which cast utensils are subject to rapid oxidation.—[*Journal des Connaissances Usuelles.*

A PROCESS FOR VARNISHING LEATHER.

[Translated from the French for the Journal of the Franklin Institute.]

The varnish for leather is the same as that for carriages, except that it contains less copal, and that the oil used in the varnish, for certain coarse articles, should be a little decomposed.

After having dressed and scraped the leather to be varnished, apply upon the flesh side a thin coat of glue water, to which has been added about an ounce of boiled linseed oil. The leather, when dried, is polished, and successive coatings applied until it becomes very smooth. Then mix one part of strong drying oil, (linseed oil, with a considerable dose of litharge,) and one of copal varnish, in an iron vessel, add well pulverized lampblack and spirits of turpentine, and set the whole over a fire. The leather which during this time has been kept in a closet, artificially heated, is now stretched upon a table, a very thin coat of the mixture quickly laid on with a flat brush, immediately replaced in the warm closet, and allowed to dry slowly: when dried it is polished with pumice stone, or which is better, with charcoal finely pounded and sifted. A second coat is applied in the same way, and the operation finishes with a third coat, which should be very lightly laid on, and be very smooth. The leather is now dried without polishing.

Leather for straps, &c. is sometimes manufactured by being passed between rollers; this enables it to receive a higher degree of polish and smoothness. Sometimes the leather is stained with

lampblack mixed in glue water, and finished as we have just described. For articles which are not intended to bend, a greater proportion of copal varnish and more spirits of turpentine are incorporated with the coating mixture. These varnishes are laid on when cold.—[*Ibid.*

PRACTICAL SCIENCE.

THE practical results of the progress of physics, chemistry, and mechanics are of the most marvellous kind; and to make them all distinct would require a comparison of ancient and modern dates. Ships that were moved by human labor in the ancient world, are transported by the winds; and a piece of steel, touched by the magnet, points out to the mariner his unerring course from the old to the new world; and by the exertions of one man of genius, and by the rosources of chemistry, a power which, by the old philosophers, could hardly have been imagined, has been generated and applied to almost all the machinery of active life; the steam engine not only performs the labor of horses, but of man, by combinations which appear almost possessed of intelligence; wagons are moved by it; constructions made; vessels caused to perform voyages in opposition to the wind and tide, and a power placed in human hands which seems almost unlimited. To these novel and still extending improvements may be added others, which, though of secondary kind, yet materially affect the comforts of life—the collections from fossil materials, the elements of combustions, and applying them so as to illuminate by a single operation, houses, streets, and even cities. If you look to the results of chemical arts, you will find new substances of the most extraordinary nature applied to various and novel purposes. You will find a few experiments in electricity leading to the marvellous results of disarming the thunder cloud of its terrors, and you will see new instruments created by human ingenuity, possessing the same powers as the electrical organs of living animals. To whatever parts of the vision of modern times you cast your eyes, you will find marks of superiority and improvement; and I wish to impress upon you the conviction, that the results of intellectual labor, or scientific genius, are permanent and incapable of being lost. Monarchs change their plans, governments their objects, a fleet or an army effects its purposes and then passes away; but a piece of steel touched by the magnet, preserves its character forever, and secures to man the dominion of the trackless ocean. A new period of society may send armies from the shores of the Baltic to those of the Euxine; and the empire of the Mahometan may be broken in pieces by a northern people, and the dominions of the

Britons in Asia may share the same fate as that of Tamerlane or Genghis Khan; but the steam boat that ascends the Mississippi or the St. Lawrence, will continue to be used, and will carry the civilization of an improved people into the deserts of North America and into the wilds of Canada.—*Sir Humphrey Davy.*

For the Young Mechanic.

REMARKS ON HAINSSELIN'S POWER MACHINE.

In the May number of the New York Mechanic's Magazine, is an account of a 'Machine or Motive Power for giving motion to Machinery of different descriptions;' which is copied from the Repertory of Arts for March. The description is accompanied with neat engravings of both the front and side views of the machine; which is very complex, and yet, very ingenious. Air and water are the two principal agents in this machine. The water is raised by two pumps, to a cistern placed high enough to supply an endless chain of buckets, which answer the purpose of a water wheel; and when in motion it turns a drum, and a large cog wheel on the same shaft, which gears into a pinion on another shaft; on which is a fly wheel, and an eccentric which moves a huge pendulum. The pendulum gives motion to the two water pumps, and is assisted by condensed air from an air chamber, that acts alternately on pistons fixed on the pump rods, and works in the upper part of the pump barrels. There is also an air pump with a lever to be worked by hand.

And now, kind reader, what do you suppose is the moving power of this wonderful machine, that is to give motion to other machinery in the same manner that a steam engine does? Why, all that I can find is the power of a man, or a boy, as the case may be, for he it is that compresses the air; the air works the pumps; the pumps raise the water; the water turns the wheels; the wheels move the pendulum; the pendulum works the pumps, but not without the compressed air; and now we are got back to the boy again; and I will leave others to calculate how much he can do.

PHILO.

Miscellany.

Pin Machine.—Mechanical ingenuity is certainly an attribute of the American man. We have just seen a beautiful exemplification of it in a pin-making machine, invented by Dr. John I. Howe, of this city, who sails with it in a day or two for England, there to procure a patent for it.

The model machine is small, beautifully made, and worked by hand. We saw it in operation, and from two sorts of wire with which it was fed—one stout for the pin, the other fine, which is twisted into the head—we saw pins complete poured forth at the rate of 40, and with the capability of producing 60 in a minute. The pins are perfect in every thing but the coloring, which, as in all cases of pin-making, is imparted by a chemical wash afterwards.

The machines now used for pin making, only make the pin, the head being afterwards put on by hand, to each separately. Here the head is more firmly, uniformly, and smoothly made and fastened on by the machine.

We cannot doubt that this all but *reasoning* machine will well reward its ingenious inventor.—*N. Y. American.*

Water in the Desert.—Two persons who understood the business of boring for water, were lately taken to Egypt, by Mr. Briggs then Consul at Cairo. They were employed under patronage of the Pacha to bore for water in the Desert. 'At about thirty feet from the ground,' says the Repertory, 'by Patent inventions they found a stratum of sand stone; when they got through that an abundant supply of water was procured. We believe the experiment has succeeded at every place where it has been made. The water is soft and pure.' In the Desert of Suex a tank has been made of 2000 cubic feet contents, and several others are in building.

Results of Accident.—Many of the most important discoveries in the field of science have been the result of accident. Two little boys of a spectacle maker in Holland, while their father was at dinner, chanced to look at a distant steeple, through two eyeglasses placed before one another. They found the steeple brought much nearer than usual to the shop-windows. They told their father on his return; and the circumstance led him to a course of experiments, which ended in the *telescope.* Some shipwrecked sailors once collected a few sea-weeds on the sand, and made a fire to warm their shivering fingers, and cook their scanty meal. When the fire went out, they found that the alkali of the sea-weed had combined with the sand, and formed *glass;*—the

basis of all our discoveries in astronomy, and absolutely necessary to our enjoyment. In the days when every astronomer was an astrologer, and every chemist a seeker after the philosopher's stone, some monks carelessly mixing up their materials, by accident invented *gunpowder*, which has done so much to diminish the barbarities of war. Sir Isaac Newton's two most important discoveries—*light* and *gravitation*—were the result of accident. His theory and experiments on light were suggested by the soap-bubbles of a child; and on gravitation, by the fall of an apple, as he sat in the orchard. And it was by hastily scratching on stone a memorandum of some articles brought him from the washer-woman's, that the idea of lithography first presented itself to the mind of Senefelder.—*Am. Bap. Mag.*

Beautiful Experiments on the Hydro-oxygen Microscope.—We were yesterday admitted at Stanley's, No. 21, Old Bond street, to a private view of one of the most extraordinary exhibitions we ever remember; it is denominated the hydro-oxygen microscope, and is an application of the light employed by Lieut. Drummond on the trigonometrical survey to microscopic purposes. A stream of oxygen gas, and another of hydrogen gas, (the chief constituents of water) are brought into union, and projected in an ignited state upon a mass of lime, producing a light of intense brilliancy, which, passing through a lens, throws the images of objects magnified from 10,000 to 500,000 times, in the manner of a solar microscope, upon a disk of 14 feet diameter. The inanimate objects consisted of fragments of insects' wings, of *fuci*, sea-weed, woods, hair, &c; all the minute external properties of which were shown upon an exaggerated scale. A few hairs of an infant appeared like tubes of two inches in diameter. A small portion of the human *pericardium* exhibited the courses of the arteries and veins. The penetrating nature of the light revealed the interior confirmation of the fleas and spiders in the object glasses. The sting of a bee was a monstrous barbed weapon, four feet long. The lancets of the horse-fly were sabres about two feet in length. The next curious part of the exhibition consisted of the small animalculæ in a drop of water, some of which are seen preying upon each other. Some skeleton larvæ were from their diaphanous texture, beautifully developed, exhibiting even the vesicle of air which enables them to rise or descend in the water; and some of the worms found in stagnant ditches, the natural size of which is a thread, appeared like the largest sized boa-constrictor. It is in short, an exhibition worthy to engage the attention of natural philosophers of the highest class, as well as of the merely curious. The instrument is constructed under the superintendence of Mr. Cooper, professor of chemistry, and Mr. Cary, the optician. The former gentleman attends and explains, very clearly and scientifically the different objects. The exhibition was crowded with

company, including persons of rank and science, Lord Sidmouth Lord Dover, Mr. Farraday, Mr. Babbage, Professor Buckland, &c.—*London Times.*

Early Application of Gunpowder to the Civil Arts.—In the life of Sir Christopher Wren, the scientific Architect who rebuilt London after the great fire in Charles II.'s time, we find that that great man used *gun powder* to bring down the old walls of St. Paul's, before the erection of that noble and beautiful piece of architecture, the present St. Paul's Cathedral, inferior in size and beauty to no building in the world, unless it be St. Peter's at Rome, which occupied twenty architects, and was in the course of building during nineteen *successive Popes.* The method he used was very similar to that which we now use for blasting rocks, or raising the stumps of trees; but the admirable precision with which he estimated the exact quantity, in his *first* attempt, is well worth notice, as it marks the sound reasoner and practical philosopher. The following is the description of the method he adopted to pull down the walls before referred to.

'To perform this work, he caused a hole to be dug, of about four feet wide, by the side of the north-west pier of the tower, in which was perforated a hole two feet square, reaching to the centre of the pier. In this he placed a small deal box, containing eighteen pounds of gunpowder. To this box he affixed a hollow cane containing a quick match, reaching to the surface of the ground above, and along the ground a train of powder was laid with a match. The mine was then closed up, and exploded, while the philosophical architect waited with confidence the result of his experiment.

'This small quantity of powder, not only lifted up the whole angle of the tower, with two great arches that rested upon it, but also two adjoining arches of the aisles, and the masonry above them. This it appeared to do in a slow but efficient manner, cracking the wall to the top, lifting visibly the whole weight about nine inches, which suddenly dropping made a great heap of ruins in the place without scattering or accident. It was half a minute before the heap already fallen opened in two or three places, and emitted smoke. By this successful experiment the force of gunpowder may be ascertained: eighteen pounds only of which, lifted up a weight of more than three thousand tons, and saved the work of a thousand laborers.'

The erection of the St. Pauls, now standing, occupied *thirty-five years*, under *one* architect and *one* bishop, which is rather singular, for men do not arrive at the head of their professions, generally, at a very early age, and the *first architect* and the first bishop, are seldom *very young men.* It was finished in 1710.—*Mechanics' Assistant.*